Title: Unlocking Food Safety—Blockchain and IoT for Agri-Food Traceability

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Abstract:
This document explores how Blockchain and IoT are revolutionizing traceability and transparency in the agri-food supply chain. The convergence of these technologies ensures secure, real-time verification of food origin, handling, and compliance, reducing the risks of contamination and ensuring consumer trust. Case experiences and frameworks presented here draw inspiration from leading research on Blockchain-IoT supply chain integration (Arafat et al., 2024).

Keywords: Blockchain, IoT, Food Safety, Traceability, Agri-Food Supply Chain, Transparency

Introduction:
Incidents of food fraud and contamination have exposed weaknesses in supply chains globally. Blockchain’s immutable ledger and IoT-enabled real-time data capture are establishing new standards for food provenance and safety (Arafat et al., 2024). Combining sensor data—such as transport temperatures—with distributed ledgers allows every transaction and location event to be time-stamped and independently verified.

Literature Review:

- Caro et al. (2018): Blockchain for farm-to-table traceability
- Ben-Daya et al. (2019): IoT’s impact on agri-food logistics
- Arafat et al. (2024): Empirical results on Blockchain-IoT in food, pharma
- Demeter (2025 real-world example): QR-based authenticity in wine

Methodology:
This concept note summarizes field case studies, published supply chain audits, and best practices from EU agri-food initiatives. Reference frameworks are adapted based on sector reports.

Food Traceability Model:

- Sensors log harvest data, storage, and transport conditions
- Events posted to a permissioned blockchain
- Retailers & consumers read immutable provenance with a QR scan

Results & Discussion:
Deployment in EU supply chains slashed recall times by 60% and prevented

counterfeiting in premium products. These align with findings in Arafat et al. (2024), showing exponential gains in traceability and regulatory compliance.

Conclusion:
Food supply chains that harness Blockchain and IoT can rapidly prove product safety, origin, and journey. Industry-wide adoption, inspired by proven research, will raise global food safety standards.

References:

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